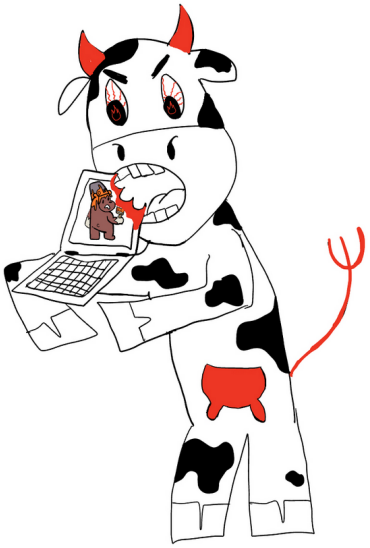
Problem 9: Bessie the Cowmputer Eater
6+2+2+1=11 Points

Problem ID: `judgehosts`
Rank: `3+3+3+3`

Introduction



After last contest's impressive turnout, the CALICO Team decided to upgrade their network by hiring the UCM (United Computing of Mañusgo) to handle the servers connecting the contestants to the judgehosts at the OCF (Open Computing Facility).

Bessie the Cow wants to sabotage CALICO as she is worried that CALICO will one day usurp USACO by becoming the more popular contest! Because the OCF servers are well protected, she travels all the way to Mañusgo to infiltrate the UCM and eat their server computers! (She loves the taste of microchips.) However, she has a limited number of stomachs and each stomach can only fit one computer. Will she successfuly sabotage the contest?

Problem Statement

CALICO has a network of $\mathbf{N}$ computers and $\mathbf{M}$ one-way connections between them. Computers are numbered from 1 to $\mathbf{N}$. *Contestant* computers are computers with no incoming connections. *Judgehost* computers are computers with no outgoing connections. Note that no computer is a contestant and a judgehost at the same time. The network is set up so that there are no connection cycles (e.g. $1 \to 2 \to 3 \to 1$ would not be allowed).

The network is considered *bridged* if there exists a sequence of connections between computers starting from a contestant computer and ending at a judgehost computer. Find up to $\mathbf{S}$ computers that Bessie can eat (remove) so that the network becomes no longer bridged. **Bessie can only eat computers that are not contestant computers nor judgehost computers.** If it's impossible for Bessie to do so, output `IMPOSSIBLE`

Note that for the main test set and bonus test set A, $\mathbf{S} = 1$.

Input Format

The first line of the input contains a single integer $\mathbf{T}$ denoting the number of test cases that follow. For each test case:

- The first line contains three space-separated integers $\mathbf{N}$ $\mathbf{M}$ $\mathbf{S}$, where:
  - $\mathbf{N}$ denotes the number of computers.
  - $\mathbf{M}$ denotes the number of connections between the computers.
  - $\mathbf{S}$ denotes the number of computers Bessie can eat.
- For each of the next $\mathbf{M}$ lines, the i^{th} line contains two space-separated integers $\mathbf{U_i}, \mathbf{V_i}$, denoting that a connection exists from computer $\mathbf{U_i}$ to computer $\mathbf{V_i}$.

Output Format

For each test case, output a space-separated list of $x \leq \mathbf{S}$ computers $s_1\ s_2\ \cdots\ s_x$ Bessie can eat such that the network is no longer bridged afterwards. If there are multiple solutions, output any of them. If it's impossible for Bessie to do so, output `IMPOSSIBLE`

Constraints

*Note: The test sets for this problem are **not necessarily cumulative**—that is, a solution that passes a test set may not necessarily solve all test sets before it! We encourage you to submit your solution to any test set you believe you can pass.*

Main Test Set

$1 \leq \mathbf{N}, \mathbf{M} \leq 1000$
$\mathbf{S} = 1$
The sum of $\mathbf{N}$ and $\mathbf{M}$, separately, across all test cases in an input does not exceed 1000.

Bonus Test Set A

$1 \leq \mathbf{N}, \mathbf{M} \leq 10^5$
$\mathbf{S} = 1$
The sum of $\mathbf{N}$ and $\mathbf{M}$, separately, across all test cases in an input does not exceed 10^5.

Bonus Test Set B

$1 \leq \mathbf{N}, \mathbf{M} \leq 1000$
$1 \leq \mathbf{S} \leq \mathbf{N}$
The sum of $\mathbf{N}$ and $\mathbf{M}$, separately, across all test cases in an input does not exceed 1000.

Bonus Test Set C

Time limit: 2 seconds.
$1 \leq \mathbf{N}, \mathbf{M} \leq 10^5$
$1 \leq \mathbf{S} \leq \mathbf{N}$
The sum of $\mathbf{N}$ and $\mathbf{M}$, separately, across all test cases in an input does not exceed 10^5.

Sample Test Cases

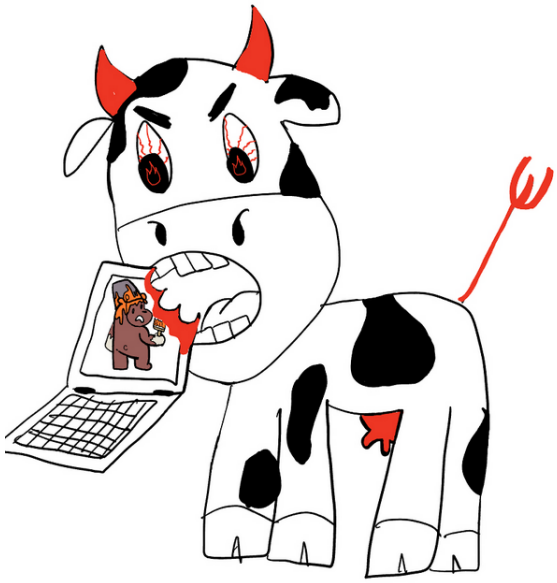
Main/Bonus A Sample Input Download

```
4
7 8 1
5 1
7 1
7 2
1 2
1 3
2 4
3 4
3 6
5 4 1
1 3
2 3
3 4
3 5
9 10 1
1 6
2 6
2 3
2 4
8 4
4 3
6 3
3 9
9 5
9 7
6 4 1
1 2
2 3
4 5
5 6
```

Main/Bonus A Sample Output Download

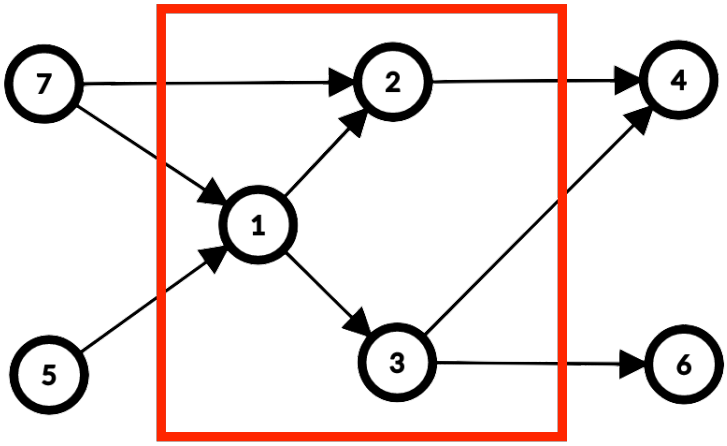
```
IMPOSSIBLE
3
9
IMPOSSIBLE
```

Note that this is one of many possible correct outputs. If there are multiple solutions, you may output any of them.

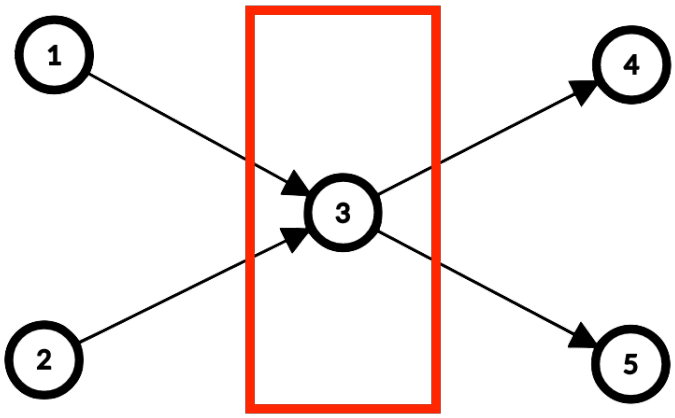


Main/Bonus A Sample Explanations

For test case #1, the contestant computers are 5 and 7, while the judgehost computers are 4 and 6. This means that Bessie can only eat computers 1, 2 and 3. Note that if Bessie tried to eat only computer 1 or only computer 3, then the network is still bridged by $7 \to 2 \to 4$. If she tried to eat only computer 2, then the same can be said for $5 \to 1 \to 3 \to 6$. Hence, it's `IMPOSSIBLE` for Bessie achieve it by just eating one computer.



For test case #2, the only computer Bessie can eat is computer 3. After eating that computer, the network is not bridged anymore.



Bonus B/C Sample Input Download

```
2
7 8 2
5 1
7 1
7 2
1 2
1 3
2 4
3 4
3 6
4 4 2
1 2
1 3
2 4
3 4
```

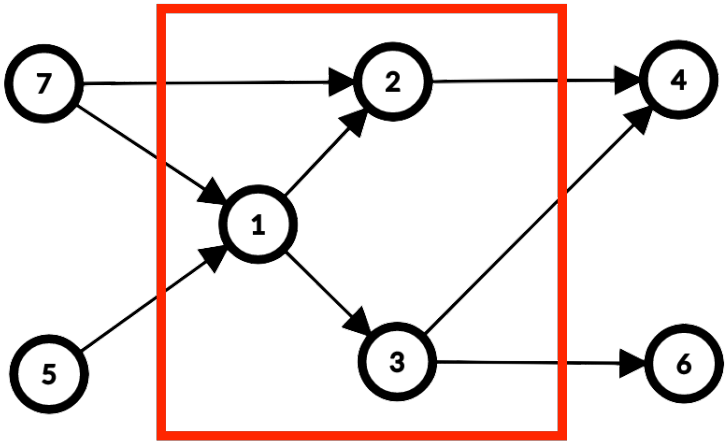
Bonus B/C Sample Output Download

```
3 2
2 3
```

Note that this is one of many possible correct outputs. If there are multiple solutions, you may output any of them.

Bonus B/C Sample Explanations

For test case #1, Bessie can eat computers $1\ 2$ so that the network is not bridged anymore. Observe that she can also eat computers $2\ 3$ to get the same result.



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第 9 题：啃电脑的贝丝牛

6+2+2+1=11 分

问题识别符: judgehosts

难度等级: 3+3+3+3

问题背景

在上一次活动取得巨大成功后，CALICO团队决定聘请UCM（Mañusgo联合计算）来进行网络升级，确保连接活动参与者和OCF(开放计算设施)评测系统的服务器稳定运行。

贝丝牛想要破坏CALICO活动，因为她担心CALICO将来会取代USACO成为最受欢迎的活动！然而，由于OCF服务器受到良好保护，贝丝牛只能专程跑到Mañusgo，闯入UCM，吃掉他们的服务器电脑！（她很喜欢芯片的味道。）但是她的胃的数量有限，每个胃只能容纳一台电脑。贝丝牛能成功破坏活动吗？

问题描述

CALICO的网络中有 N 台电脑，电脑之间有 M 个单向连接。电脑编号从 1 到 N。活动参与者的电脑没有传入连接。评测系统的电脑没有传出连接。如此一来，一台电脑不会同时是属于活动参与者和评测系统的。并且这个网络中不会出现连接循环（例如，不允许出现1→2→3→1）。

如果存在一串由活动参与者电脑开始并以评测系统电脑结束的连接，则该网络被认为处于桥接中。请找到贝丝牛可以吃掉（移除）的最多 S 台电脑，使网络断开桥接。另外，**贝丝牛只能吃掉除了活动参与者和评测系统之外的电脑**。如果贝丝牛做不到的话，请输出“IMPOSSIBLE”。

注意，主要测试集和附加测试集A中，S = 1。

输入格式

输入的第一行包含整数 $\mathbf{T}$，表示测试用例数量。对于每一个测试用例：

- 第一行包括三个用空格隔开的整数 $\mathbf{N}$ $\mathbf{M}$ $\mathbf{S}$：
  - $\mathbf{N}$ 表示电脑数量。
  - $\mathbf{M}$ 表示电脑之间连接的数量。
  - $\mathbf{S}$ 表示贝丝牛可以吃的电脑数量。
- 对于接下来 $\mathbf{M}$ 行中的每一行，第 i 行包含两个用空格隔开的整数 $\mathbf{U_i}$, $\mathbf{V_i}$，表示从电脑 $\mathbf{U_i}$ 到电脑 $\mathbf{V_i}$ 有一个连接.

输出格式

对于每一个测试用例，输出一列用空格隔开的贝丝牛可以吃掉的 $x \leq \mathbf{S}$ 台电脑 s_1 s_2 $\cdots$ s_x，使网络断开桥接。如果存在多个解决方案，请输出其中任意一个。如果贝丝牛无法断开桥接的话，请输出“IMPOSSIBLE”。

数据范围

注意：此题的测试集不一定是累积的，即能通过一个测试集的解题方法不一定能通过其之前的所有测试集！我们鼓励你提交一个你认为能够通过任何测试集的解题方法。

主要测试集

$1 \leq \mathbf{N}, \mathbf{M} \leq 1000$

$\mathbf{S} = 1$

所有测试用例的输入值N的和、输入值M的和分别不超过1000。

附加测试集A

$1 \leq \mathbf{N}, \mathbf{M} \leq 10^5$

$\mathbf{S} = 1$

所有测试用例的输入值N的和、输入值M的和分别不超过10^5。

附加测试集B

$1 \leq \mathbf{N}, \mathbf{M} \leq 1000$

$1 \leq \mathbf{S} \leq \mathbf{N}$

所有测试用例的输入值N的和、输入值M的和分别不超过1000。

附加测试集C

时间限制: 2秒。

$1 \leq \mathbf{N}, \mathbf{M} \leq 10^5$

$1 \leq \mathbf{S} \leq \mathbf{N}$

所有测试用例的输入值N的和、输入值M的和分别不超过10^5。

测试样例

主样例/附加A样例输入 下载

```
4
7 8 1
5 1
7 1
7 2
1 2
1 3
2 4
3 4
3 6
5 4 1
1 3
2 3
3 4
3 5
9 10 1
1 6
2 6
2 3
2 4
8 4
4 3
6 3
3 9
9 5
9 7
6 4 1
1 2
2 3
4 5
5 6
```

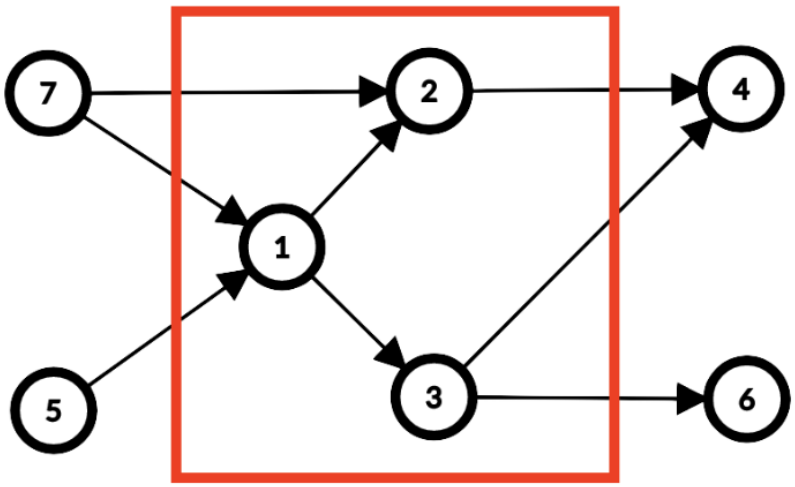
主样例/附加A样例输出 下载

```
IMPOSSIBLE
3
9
IMPOSSIBLE
```

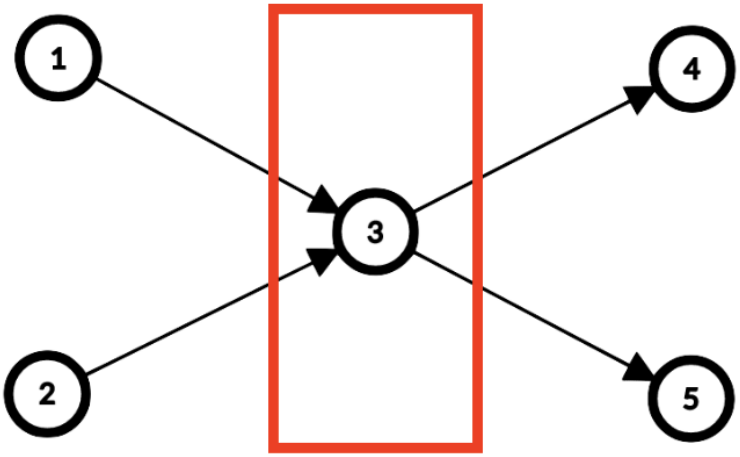
注意，此为众多可能中的正确输出之一。如果存在多种解决方案，请输出其中任意一个。

主样例/附加A样例解释

对于测试用例#1，活动参与者电脑为 5 和 7，评测系统电脑为 4 和 6。这意味着贝丝牛可以吃掉电脑 1、2、3。注意，如果她只吃掉电脑 1 或电脑 3，网络仍处于桥接中：7 → 2 → 4。如果她只吃掉电脑 2，网络仍处于桥接中：5 → 1 → 3 → 6。因此，如果贝丝牛只吃掉一台电脑，这个网络无法断开桥接，输出“IMPOSSIBLE”。



对于测试用例#2, 贝丝牛可以吃的只有电脑 3。吃掉电脑 3 后，网络断开桥接。



附加B样例输入 下载

```
2
7 8 2
5 1
7 1
7 2
1 2
1 3
2 4
3 4
3 6
4 4 2
1 2
1 3
2 4
3 4
```

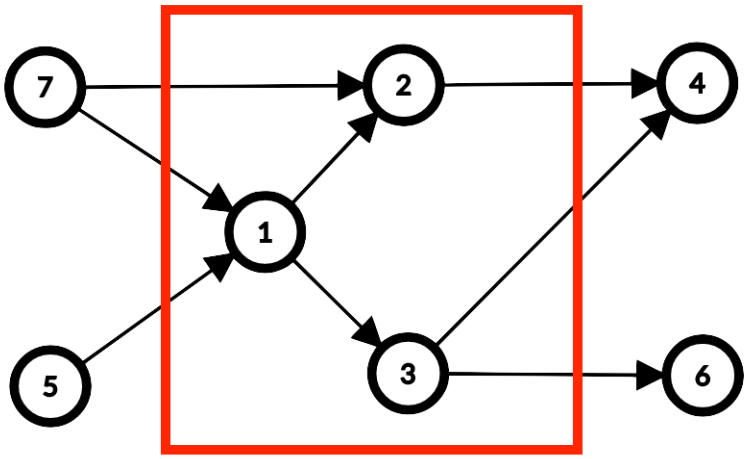
附加B样例输出 下载

```
3 2
2 3
```

注意，此为众多可能中的正确输出之一。如果存在多种解决方案，请输出其中任意一个。

附加B/C样例解释

对于测试用例#1，贝丝牛可以吃掉电脑 1 和 2，使网络断开桥接。她也可以通过吃掉电脑 2 和 3 来得到相同的结果。



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